

REMARKS

Claims 1-23 are pending in the present application. By this reply, claims 16-23 have been added. Claim 1, 3, 7, 8 and 10 are independent claims.

The specification and claims have been amended to correct minor informalities and to clarify the invention. These modifications do not add any new matter to the disclosure and are fully supported by the original disclosure.

CLAIM OBJECTION

Claim 15 has been objected to because of certain minor informalities. To overcome this objection, claim 15 has been amended as suggested by the Examiner. Accordingly, reconsideration and withdrawal of the objection is respectfully requested.

35 U.S.C. § 103(a) REJECTION

Claims 1-11 and 13-15 have been rejected under 35 U.S.C § 103(a) as being unpatentable over *Hall* (U.S. Patent No. 5,841,494) in view of *Abileah et al.* (U.S. Patent No. 5,629,784) and *Kaneko* (U.S. Patent No. 6,295,108). This rejection, insofar as it pertains to the presently pending claims, is respectfully traversed.

Hall as shown in Fig. 6, discloses two CLC polarizers 12 and 17 that surround the LC cell 4. *Hall's* LCD device is a transflective LCD device where

both the ambient light 1 and light from a back light source 11 can be used to display an image on the display device. However, as acknowledged by the Examiner, *Hall* does not disclose, *inter alia*, a linear polarizer, a linear polarizing transformer, a hologram diffuser, a collimating member, and a $\lambda/4$ film. To correct these deficiencies, the Examiner further relies on *Abileah et al.* and *Kaneko*.

Particularly, the Examiner relies on *Abileah et al.* for teaching a collimating member and a hologram diffuser. The Examiner relies on *Kaneko* for teaching a $\lambda/4$ film disposed below the upper linear polarizer. The Examiner asserts that it would have been obvious to one skilled in the art to modify the LCD of *Hall* with the teachings of *Abileah et al.* and *Kaneko* by “forming a collimating sheet, a hologram diffuser, a linear polarizer, and a quarter wavelength film below the linear polarizers was so as to improve the brightness and the contrast ratio over a wide range of viewing angles” (last paragraph on page 4 of the Office Action). Applicants respectfully disagree.

First, each of *Hall*, *Abileah et al.* and *Kaneko* teaches an LCD having only certain elements of Applicants’ claimed invention. None of these references teach or suggest how and why certain elements in the references should be replaced with certain elements from other references. The Examiner’s assertion that it would have been obvious to one skilled in the art to selectively pick and choose various elements from *Abileah et al.* and *Kaneko* and replace

and/or add to the existing elements of *Hall's* LCD device is at best a mere speculation in view of Applicants' claimed invention.

Second, it would not have been obvious to combine these references as suggested by the Examiner, since the functions and operations of the LCD device taught in each of these references are different to render the modifications non-obvious. For example, *Hall* is directed to providing two CLC polarizers and does not use any linear polarizer. *Abileah et al.* as shown in Fig. 3 only utilizes linear polarizers and does not include any CLC polarizer. *Kaneko* is directed to an LCD using a combination of CLC polarizers and a linear polarizer.

Third, even if the references are combinable (assuming *arguendo*), the combination of references does not teach at least certain features recites in the independent claims. For example, the combined references do not teach or suggest, *inter alia*:

the hologram diffuser diffuses the revolved circularly polarized light from the liquid crystal layer; and

a linear polarizing transformer to transform the diffused circularly polarized light from the hologram diffuser into linearly polarized light

as recited in independent claim 1, because none of the references teach such a hologram diffuser and a linear polarizing transformer. Note that in Fig. 3 of *Abileah et al.*, the hologram diffuser 21 diffuses the linearly polarized light and the linear polarizer 15 does not transform the diffused circularly polarized light

from the hologram diffuser into a linearly polarized light. That is, a linear polarizer is different from a linear polarizing transformer because a linear polarizer does not transform a circularly-polarized light into linearly polarized light, but rather selectively transmits it. In Fig. 14 of *Kaneko*, there is no specific hologram diffuser in the LCD. The light diffusing sheet 15 is above the linear polarizer 8 such that the linear polarizer 8 cannot and does not transform any light from the light diffusing sheet 15.

Regarding independent claim 3, the combined references do not teach or suggest, *inter alia*:

a $\lambda/4$ film to transform the circularly polarized light. . .
into linearly-polarized light;

a first linear polarizer above the $\lambda/4$ film;

a liquid crystal layer above the first linear polarizer

as recited in claim 3, because these features are neither nor suggested in any of the prior art references. For instance, *Abileah et al.* in Fig. 3 does not use a $\lambda/4$ film. On the other hand, *Kaneko* as shown in Fig. 14 includes a $\lambda/4$ film 9. However, this film is disposed below an LC layer 12 which is disposed below the linear polarizer 8.

Regarding independent claim 7, the combined references do not teach or suggest, *inter alia*:

a $\lambda/4$ film to transform the circularly polarized light...
into linearly-polarized light;

a linear polarizer above the $\lambda/4$ film;

a lower substrate above the linear polarizer
as recited in claim 7, because these features are neither taught nor suggested in any of the prior art references. For instance, *Abileah et al.* as shown in Fig. 3 does not include any $\lambda/4$ film. On the other hand, as shown in Fig. 14, *Kaneko* provides the linear polarizer 8 above the LC layer 12 and a lower substrate.

Regarding claim 8, the above arguments made for traversing the rejection of claim 1 are similarly applicable to claim 8.

Regarding independent claim 10, the combined references do not teach or suggest, *inter alia*:

a cholesteric liquid crystal (CLC) polarizer . . . ;

an upper substrate . . . and including a holographic diffuser . . . ; and

an upper linear polarizer above the upper substrate and polarizing the diffused light from the holographic diffuser

as recited in claim 10, because these features are neither taught nor suggested by the prior art references. For instance, *Abileah et al.* as shown in Fig. 3 discloses a holographic diffuser 21, but does not involve the use of a CLC polarizer. On the other hand, *Kaneko* as shown in Fig. 14 includes the use of a CLC polarizer and an upper linear polarizer 8. However, it does not disclose a holographic diffuser. The diffusing sheet 15 of *Kaneko* is disposed above the linear polarizer 8.

Accordingly, the invention as recited in independent claims 1, 3, 7, 8 and 10 and its dependent claims (due to their dependency) is patentable over the applied references and reconsideration and withdrawal of the rejection based on these reasons is respectfully requested.

Claim 12 has been rejected under 35 U.S.C § 103(a) as being unpatentable over *Hall* in view of *Abileah et al.* and *Kaneko* as applied to claims 1-11 and 13-15 above and further in view of *Davis et al.* (U.S. Patent No. 5,882,029).

As discussed above, the combination of *Hall*, *Abileah et al.* and *Kaneko* (assuming *arguendo* that they are combinable) does not teach or suggest, *inter alia*:

a cholesteric liquid crystal (CLC) polarizer . . .;

an upper substrate . . . and including a holographic diffuser . . .; and

an upper linear polarizer above the upper substrate and polarizing the diffused light from the holographic diffuser

as recited in independent claim 10 from which claim 12 depends. *Davis et al.* does not overcome these deficiencies in the combined references since it merely discloses a color filter and a polarizer for providing an illumination system. None of the above-identified features are disclosed or suggested in *Davis et al.* The Examiner has relied on *Davis et al.* for allegedly teaching an absorbing type color filter layer.

Therefore, assuming *arguendo* that the references are combinable, the combination of references as applied by the examiner does not teach or suggest the invention as recited in independent claim 10, and reconsideration and withdrawal of the rejection based on these reasons is respectfully requested.

CONCLUSION

For the foregoing reasons and in view of the above clarifying amendments, Applicants respectfully request the Examiner to reconsider and withdraw all of the objections and rejections of record, and earnestly solicit an early issuance of a Notice of Allowance.

Should there be any outstanding matters which need to be resolved in the present application, the Examiner is respectfully requested to contact Esther H. Chong (Registration No. 40,953) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and further replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

BIRCH, STEWART, KOLASH & BIRCH, LLP

By *Ether H. Chong* #40,953
for Joseph A. Kolasch
Registration No. 22,463

P.O. Box 747
Falls Church, VA 22032-0747
(703) 205-8000

JAK/EHC:lmh

Enclosures: Version with Markings to Show Changes Made

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

The specification has been replaced as follows:

On page 8, please replace the last paragraph as follows:

--The resultant right-circular [left-circular] polarized light having been diffused though the hologram diffuser 242 passes through the $\lambda/4$ film 250, compensation film 252, and linear polarizer 254 successively, thereby being transformed into a linearly-polarized light.--

On page 9, please replace the second paragraph as follows:

Fig. 3 shows a cross-sectional view of an LCD according to a second embodiment of the present invention. Referring to Fig. 3, the second embodiment of the present invention includes a back light unit a3 producing and uniformly supplying light, and a collimating sheet 310 for collimating the light supplied from the back light unit a3. A CLC polarizer 312 transmits left-circular polarized light having a specific wavelength out of the light transmitted by the collimating sheet 310. The CLC polarizer reflects the rest of the light for recycling by reflection plate 300. A lower substrate 320, on which a CLC color filter layer 322 is formed, transmits the left-circular polarized light having a specific wavelength of R, G or B of the light transmitted by the polarizer 312 and reflects the rest. A $\lambda/4$ film 350 transforms the left-circular

polarized light having passed through the CLC color filter layer 322 into linearly-polarized light. A first linear polarizer 354a is disposed under a liquid crystal layer 330 for transmitting the linearly-polarized light. An upper substrate 340 on which a hologram diffuser 342 and a planarization layer 344 covering the hologram diffuser 342 are formed, where the hologram diffuser 342 diffuses the linearly-polarized light having passed through the liquid crystal layer 330. A second linear polarizer 354b is provided on the upper substrate 340.--

On page 12, the third paragraph has been replaced as follows:

--Also, the transmitted left-circular polarized light, which has passed through the CLC polarizer 512 and which has a specific wavelength of R, G or B, passes through the CLC color filter layer 522, but the rest is reflected. Then, the diffused left-circular polarized light passes through the linear polarizing transformer [polarizer] 554, and is thereby transformed into a linearly-polarized light.--

In the Claims

The claims have been amended as follows:

1. (Amended) A liquid crystal display usable with a back light source supplying light, comprising:

- [a back light unit to produce and supply light;
- a collimating sheet to collimate the light supplied by the back light unit;]
- a cholesteric liquid crystal (CLC) polarizer to transmit one of left-circularly polarized light and right-circularly polarized light from the back light source [collimating sheet], and to reflect other light not transmitted;
- a lower substrate on which a CLC color filter layer is formed wherein the CLC color filter layer transmits the circularly polarized light from the CLC polarizer having certain [specific red, green, and blue] wavelengths and reflects other light not transmitted;
- a liquid crystal layer to selectively revolve a polarized direction of the circularly polarized light from the CLC color filter layer;
- an upper substrate over the liquid crystal layer having a hologram diffuser [and a planarization layer disposed thereon and] wherein the hologram diffuser diffuses the revolved circularly polarized light from the liquid crystal layer; and
- a linear polarizing transformer to transform the diffused circularly polarized light from the hologram diffuser into linearly polarized light.

3. (Amended) A liquid crystal display usable with a back light source supplying light, comprising:

[a back light unit to produce and supply light;
a collimating sheet to collimate the light supplied by the back light unit;]
a cholesteric liquid crystal (CLC) polarizer to transmit one of
left-circularly polarized light and right-circularly polarized light from the back
light source [collimating sheet], and to reflect other light not transmitted;
a lower substrate on which a CLC color filter layer is formed wherein the
CLC color filter layer transmits the circularly polarized light from the CLC
polarizer having certain [specific red, green, and blue] wavelengths and reflects
other light not transmitted;
a $\lambda/4$ film to transform the circularly polarized light from the CLC color
filter layer into linearly-polarized light;
a first linear polarizer above the $\lambda/4$ film;
a liquid crystal layer above the first linear polarizer and to selectively
transmit the linearly-polarized light; and
an upper substrate over the liquid crystal layer and having a hologram
diffuser [and a planarization layer disposed thereon and] wherein the hologram
diffuser diffuses the linearly-polarized light from the liquid crystal layer.

7. (Amended) A liquid crystal display usable with a back light source
supplying light, comprising:

[a back light unit to produce and supply light;
a collimating sheet to collimate the light supplied by the back light unit;]

a cholesteric liquid crystal (CLC) polarizer to transmit one of left-circularly polarized light and right-circularly polarized light from the back light source [collimating sheet], and to reflect other light not transmitted;

a $\lambda/4$ film to transform the circularly polarized light from the CLC polarizer into linearly-polarized light;

a linear polarizer above the $\lambda/4$ film;

a lower substrate above the linear polarizer;

a liquid crystal layer above the lower substrate; and

an upper substrate over the liquid crystal layer and having a hologram diffuser[, a planarization layer, and an absorbing type color filter layer disposed thereon and] wherein the hologram diffuser diffuses the linearly-polarized light from the liquid crystal layer.

8. (Amended) A liquid crystal display usable with a back light source supplying light, comprising:

[a back light unit to produce and supply light;]

a collimating member [sheet] to collimate the light supplied by the back light source [unit];

a cholesteric liquid crystal (CLC) polarizer to transmit one of left-circularly polarized light and right-circularly polarized light from the collimating member [sheet], and to reflect other light not transmitted;

a lower substrate on which a CLC color filter layer is disposed wherein the CLC polarizer transmits light from the CLC polarizer having certain [specific red, green, and blue] wavelengths and reflects other light not transmitted;

a liquid crystal layer; [and]

an upper substrate over the liquid crystal layer and having a hologram diffuser and[,] a planarization layer to planarize the hologram diffuser[,] and a linear polarizer disposed thereon and] wherein the hologram diffuser diffuses light from the liquid crystal layer; and

a linear polarizing transformer polarizing the diffused light into linearly-polarized light.

10. (Amended) A liquid crystal display, comprising:

a back light unit to produce and supply light;

a collimating member [sheet] to collimate the light supplied by the back light unit;

a cholesteric liquid crystal (CLC) polarizer to transmit circularly polarized light of a predetermined direction from the collimating member [sheet], and to reflect other light not circularly polarized in the predetermined direction;

a lower substrate above the CLC polarizer;

an upper substrate above the lower substrate and including a holographic diffuser disposed thereon and wherein the hologram diffuser diffuses light without altering a polarization of the light;

a liquid crystal layer disposed between the lower substrate and the upper substrate;

a color filter layer to transmit only predetermined wavelengths of light disposed between the lower substrate and the upper substrate; and

an upper linear polarizer above the upper substrate and polarizing the diffused light from the holographic diffuser.

15. (Amended) The liquid crystal display according to claim 10, further comprising:

a compensating film disposed between the $\lambda/4$ film and the upper linear polarizer to transform light into linearly-polarized light.

Claims 16-23 have been added.